

CLAIMS

What is claimed is:

1. A binding domain-immunoglobulin fusion protein, comprising:
 - 5 (a) a binding domain polypeptide that is fused to an immunoglobulin hinge region polypeptide, wherein said hinge region polypeptide is selected from the group consisting of (i) a mutated hinge region polypeptide that contains no cysteine residues and that is derived from a wild-type immunoglobulin hinge region polypeptide having one or more cysteine residues, (ii) a mutated hinge region polypeptide
10 that contains one cysteine residue and that is derived from a wild-type immunoglobulin hinge region polypeptide having two or more cysteine residues, (iii) a wild-type human IgA hinge region polypeptide, (iv) a mutated human IgA hinge region polypeptide that contains no cysteine residues and that is derived from a wild-type human IgA region polypeptide, and (v) a mutated human IgA hinge region polypeptide that contains one cysteine residue
15 and that is derived from a wild-type human IgA region polypeptide;
 - (b) an immunoglobulin heavy chain CH2 constant region polypeptide that is fused to the hinge region polypeptide; and
 - (c) an immunoglobulin heavy chain CH3 constant region polypeptide that is fused to the CH2 constant region polypeptide,
- 20 wherein:
 - (1) the binding domain-immunoglobulin fusion protein is capable of at least one immunological activity selected from the group consisting of antibody dependent cell-mediated cytotoxicity and complement fixation, and
 - (2) the binding domain polypeptide is capable of specifically binding to
25 an antigen.
2. The binding domain-immunoglobulin fusion protein of claim 1 wherein the immunoglobulin hinge region polypeptide is a mutated hinge region

polypeptide and exhibits a reduced ability to dimerize, relative to a wild-type human immunoglobulin G hinge region polypeptide.

3. The binding domain-immunoglobulin fusion protein of claim 1
5 wherein the binding domain polypeptide comprises at least one immunoglobulin variable region polypeptide that is selected from the group consisting of an immunoglobulin light chain variable region polypeptide and an immunoglobulin heavy chain variable region polypeptide.

10 4. The binding domain -immunoglobulin fusion protein of claim 3 wherein the immunoglobulin variable region polypeptide is derived from a human immunoglobulin.

5. The binding domain Fv-immunoglobulin fusion protein of claim 1
15 wherein the binding domain polypeptide comprises:
(a) at least one immunoglobulin light chain variable region polypeptide;
(b) at least one immunoglobulin heavy chain variable region polypeptide; and
(c) at least one linker peptide that is fused to the polypeptide of (a) and
20 to the polypeptide of (b).

6. The binding domain-immunoglobulin fusion protein of claim 5 wherein the immunoglobulin light chain variable region and heavy chain variable region polypeptides are derived from human immunoglobulins.

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7. The binding domain-immunoglobulin fusion protein of claim 1 wherein at least one of the immunoglobulin heavy chain CH2 constant region polypeptide

and the immunoglobulin heavy chain CH3 constant region polypeptide is derived from a human immunoglobulin heavy chain.

5 8. The binding domain-immunoglobulin fusion protein of claim 1 wherein the immunoglobulin heavy chain constant region CH2 and CH3 polypeptides are of an isotype selected from the group consisting of human IgG and human IgA.

10 9. The binding domain-immunoglobulin fusion protein of claim 1 wherein the antigen is selected from the group consisting of CD19, CD20, CD37, CD40 and L6.

15 10. The binding domain-immunoglobulin fusion protein of claim 5 wherein the linker polypeptide comprises at least one polypeptide having as an amino acid sequence Gly-Gly-Gly-Gly-Ser [SEQ ID NO:21].

 11. The binding domain-immunoglobulin fusion protein of claim 5 wherein the linker polypeptide comprises at least three repeats of a polypeptide having as an amino acid sequence Gly-Gly-Gly-Gly-Ser [SEQ ID NO:21].

20 12. The binding domain-immunoglobulin fusion protein of claim 1 wherein the immunoglobulin hinge region polypeptide comprises a human IgA hinge region polypeptide.

25 13. The binding domain-immunoglobulin fusion protein of claim 1 wherein the binding domain polypeptide comprises a CD154 extracellular domain.

14. The binding domain-immunoglobulin fusion protein of claim 1 wherein the binding domain polypeptide comprises a CD154 extracellular domain and at least one immunoglobulin variable region polypeptide.

5 15. An isolated polynucleotide encoding a binding domain-immunoglobulin fusion protein, said protein comprising:

(a) a binding domain polypeptide that is fused to an immunoglobulin hinge region polypeptide, wherein said hinge region polypeptide is selected from the group consisting of (i) a mutated hinge region polypeptide that contains
10 no cysteine residues and that is derived from a wild-type immunoglobulin hinge region polypeptide having one or more cysteine residues, (ii) a mutated hinge region polypeptide that contains one cysteine residue and that is derived from a wild-type immunoglobulin hinge region polypeptide having two or more cysteine residues, (iii) a wild-type human IgA hinge region polypeptide, (iv) a mutated human IgA hinge region polypeptide that contains
15 no cysteine residues and that is derived from a wild-type human IgA region polypeptide, and (v) a mutated human IgA hinge region polypeptide that contains one cysteine residue and that is derived from a wild-type human IgA region polypeptide;

(b) an immunoglobulin heavy chain CH2 constant region polypeptide that is fused to the hinge region polypeptide; and

20 (c) an immunoglobulin heavy chain CH3 constant region polypeptide that is fused to the CH2 constant region polypeptide,

wherein:

(1) the binding domain-immunoglobulin fusion protein is capable of at least one immunological activity selected from the group consisting of antibody dependent
25 cell-mediated cytotoxicity and complement fixation, and

(2) the binding domain polypeptide is capable of specifically binding to an antigen.

16. A recombinant expression construct comprising a polynucleotide according to claim 15 that is operably linked to a promoter.

17. A host cell transformed or transfected with a recombinant expression
5 construct according to claim 16.

18. A method of producing a binding domain-immunoglobulin fusion protein, comprising the steps of:

- (a) culturing a host cell according to claim 17 under conditions that permit expression of the binding domain-immunoglobulin fusion protein; and
- 10 (b) isolating the binding domain-immunoglobulin fusion protein from the host cell culture.

19. A pharmaceutical composition comprising a binding domain-immunoglobulin fusion protein according to claim 1 in combination with a physiologically
15 acceptable carrier.

20. A method of treating a subject having or suspected of having a malignant condition or a B-cell disorder, comprising administering to a patient a therapeutically effective amount of a binding domain-immunoglobulin fusion protein
20 according to claim 1.

21. The method of claim 20 wherein the malignant condition or B-cell disorder is selected from the group consisting of a B-cell lymphoma and a disease characterized by autoantibody production.

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22. The method of claim 20 wherein the malignant condition or B-cell disorder is selected from the group consisting of rheumatoid arthritis, myasthenia gravis, Grave's disease, type I diabetes mellitus, multiple sclerosis and an autoimmune disease.